

## UNIVERSITY OF CALIFORNIA, SANTA CRUZ

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INSTITUTE OF MARINE SCIENCES  
APPLIED SCIENCES BUILDING  
FAX NUMBER (408) 459-4882

SANTA CRUZ, CALIFORNIA 95064

Ms. Kate Hansel  
CALFED Bay-Delta Program  
1416 Ninth St. - Suite 1155  
Sacramento, CA 95814

July 25, 1997

Brian Anderson  
University of California, Santa Cruz  
C/O Marine Pollution Studies Laboratory  
34500 Coast Rte 1  
Monterey, CA 93940

Dear Ms. Hansel:

Enclosed is an Inquiry Proposal for your consideration as part of the CALFED Bay-Delta Program Category III RFP process. The proposed study is intended as a pilot project to assess sediment contaminant concentrations and their effects on the Bay-Delta ecosystem. I am submitting this proposal on behalf of Dr. Ron Tjeerdema at the University of California, Santa Cruz (UCSC), and Dr. John Oliver, at San Jose State University- Moss Landing Marine Laboratories (MLML). The project will be conducted jointly by researchers and staff from UCSC and MLML. These groups have cooperated in similar studies throughout the state. Dr. Tjeerdema will act as the project's Principal Investigator, and will be responsible for overall project management. Researchers at UCSC will be responsible for trace organic chemical analyses, sediment toxicological analyses, data management and report writing. Researchers at MLML will be responsible for sample collection, trace metal analyses, benthic community analyses, and report writing. We feel this project will provide much needed data on the extent and effects of contaminated sediments in the primary zone of the Delta, an issue identified as a research priority by technical teams advising CALFED. Please contact me at the above address, or at (phone: 408- 624-0947; email: bsanders@cats.ucsc.edu), if you have any questions. You may also contact Dr. Ron Tjeerdema at UCSC if you require more information (mail: Dept. of Chemistry and Biochemistry, UCSC, Santa Cruz, CA 95064; phone: 408-459-2917; email: tjeerdem@hydrogen.ucsc.edu). Thank you for taking the time to consider this proposal.

Sincerely,

A handwritten signature in cursive script that reads "Brian Anderson".

Brian Anderson  
Research Specialist

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Brian Anderson  
Research Specialist

## **CALFED BAY-DELTA PROGRAM- INQUIRY PROPOSAL**

### **A.) Project Title: MONITORING AND ASSESSMENT OF CONTAMINATED SEDIMENTS IN THE BAY-DELTA SYSTEM**

**Applicant Name:** University of California, Santa Cruz (Principal Investigator Dr. Ron Tjeerdema) and San Jose State University Foundation (Moss Landing Marine Laboratories, Principal Investigator Dr. John Oliver).

**B.) Project Description:** Many contaminants released into aquatic environments bind to particles and accumulate in sediments. Sediment-associated contaminants may impact aquatic ecosystems through acute and chronic effects on benthic and epibenthic organisms, and through their release and subsequent impact on species inhabiting overlying waters. This project will measure contaminants in sediments at selected stations within the primary zone of the Delta using standard chemical and toxicological methods. Chemical concentrations will be compared to existing sediment quality guidelines to determine the relative degree of contamination. In addition, the effects of contaminants on Bay-Delta sediment and water column indicator species will be assessed using accepted toxicity test methods. The effects of contaminants on benthic community structure will also be assessed. The relationship between the presence of toxic contaminants and relevant ecological effects will be investigated using multivariate statistical analyses and standard hypothesis test statistics. These analyses can be used to evaluate the suitability of existing sediment quality guidelines for use in the Delta.

The ecological objectives of this project are to ensure that continued adequate water quality is provided for key Delta species. This includes providing clean water to early and adult life stages of winter and fall run chinook salmon, delta and longfin smelt, steelhead trout, sturgeon, and the vertebrate and invertebrate prey organisms upon which these species rely. The specific objectives are to measure sediment-associated contaminants and assess the potential for contaminant impact on benthic and overlying water quality in the primary zone of the Delta. The benthic environment is a key Delta habitat because it is home to infauna and epibenthic species which are a primary component of the Delta foodweb. There is potential for direct acute and chronic effects of sediment contaminants on benthic and overlying water species through direct effects on benthic infauna, through the flux of contaminants out of the sediment, and through remobilization of sediment-bound contaminants as a result of dredging and habitat restoration activities. It is important, therefore, that monitoring and assessment programs include measures of sediment contaminants and assess biological effects in order to provide Delta regulators with data necessary for informed management decisions both before, during, and after proposed activities.

**C.) Approach/Tasks/Schedule:** This project will follow general methods used in the San Francisco Bay Regional Monitoring Program (RMP) and the State Water Resources Control Board's Bay Protection and Toxic Cleanup Program (BPTCP). This study is designed to be a first phase pilot project to precede more comprehensive monitoring that would continue to provide information on the effects of restoration, dredging, and other activities in the Delta under CALFED. Sediment samples will be collected at approximately 80 stations distributed throughout the primary zone of the Delta. Station selection will be based on a widely-spaced stratified random sampling strategy designed to assess sediment contamination throughout the primary zone of the Delta. Specific areas of concern will be sampled more intensively in order to delineate areal extent of contamination and toxicity. Sampling will also incorporate uncontaminated reference sites identified from previous data. Data from these sites will be compared to contaminated sites using established statistical methods. Samples will be analyzed for bulk sediment trace metal and trace organic concentrations, sediment grain size and total organic carbon. Split samples will be analyzed for toxicity, benthic community structure, and basic water quality parameters. As with the RMP, sampling is proposed twice during a one year period, once each during wet and dry seasons. The project will be designed as a pilot project to proceed in three stages starting in January 1998 (sampling design and site selection), proceeding through summer monitoring in June 1998, and winter monitoring in February 1999. A final report will be completed by December 1999.

**D.) Project Justification:** This project is justified as part of the CALFED goal to provide clean water for important Delta species. Preliminary surveys have indicated that Delta sediments are contaminated by metals, pesticides, PAHs

and PCBs, but there is insufficient data to adequately evaluate distribution and associated effects of sediment-bound contaminants in the Delta. It is likely that sediment contaminants will be remobilized during levy repair and as a result of the construction of the in-channel Delta islands currently under consideration for habitat restoration. Remobilized toxicants may impact sediment and water column species through direct effects and through bioaccumulation of contaminants in the Delta foodweb. Minimizing water quality problems associated with Delta dredging and restoration activities is one of several priorities identified by the CALFED Bay Delta Program technical teams.

E). Budget Costs and Third Party Impacts: Chemistry, toxicity, and benthic community monitoring will be conducted at 80 stations during two separate seasons. Cost for this project is estimated to be approximately \$800,000 depending on the number of samples and analyses incorporated into the final study design. No third party impacts are anticipated.

F). Applicant Qualifications: The University of California, Santa Cruz, and San Jose State University Foundation have been the primary contractors for similar large scale monitoring and assessment programs elsewhere in the State. Both University laboratories have been involved in all aspects of project planning, implementation, data collection, analysis and interpretation, and management for the State Water Resources Control Board's Bay Protection and Toxic Cleanup Program. The University of California Santa Cruz research group under the direction of Dr. Ron Tjeerdema is also responsible for sediment toxicity assessments, data analyses, and report preparation as part of the S.F. Bay Regional Monitoring Program.

G). Monitoring and Data Evaluation: Chemistry data will be compared to existing sediment quality criteria developed by EPA, and sediment quality guidelines developed by NOAA, the State of Florida, and the National Biological Survey. Toxicity data will be analyzed using standard hypothesis testing procedures comparing toxicity in control and reference samples to those at contaminated stations. The influence of measured contaminants, water quality parameters, sediment grain size, and TOC on toxicity test results will be assessed using single and multivariate statistical analyses similar to those employed in the SF Bay RMP. Information on benthic community structure will be combined with data on toxicity and chemical contamination following the weight-of-evidence approach commonly referred to as the Sediment Quality Triad. All data will be incorporated into a Sediment Quality Triad decision matrix in order to assess relative contamination and toxicity of Delta samples, and the potential for these samples to contribute to degradation of Delta water quality.

H). Coordination with Other Programs/Compatibility with CALFED Objectives: This project is compatible with CALFED objectives to ensure adequate water quality for Delta species. The proposed monitoring and assessment program will complement ongoing sediment and water quality monitoring programs in the Central Valley and San Francisco Bay. There is currently no sediment monitoring program in the Delta, and this data gap limits informed management decisions by regulators responsible for maintaining the ecological health of the Delta and San Francisco Bay. The Bay-Delta system is part of the largest watershed in the State and is the receiving system for multiple pollution sources. Because there is a potential for significant contaminant deposition in Delta sediments, it is important that the effects of contaminated sediments on the Bay-Delta ecosystem be investigated.

Project contractors will coordinate sampling periods to coincide with sampling by existing and proposed programs. In addition, we will consult with Central Valley and RMP scientists and managers to ensure that comparable methods are used so that data generated in the Delta sediment monitoring and assessment program may be compared directly to those generated by the RMP and other relevant programs. Station selection will include some stations currently analyzed for benthic community and other ecosystem metrics conducted by the Department of Water Resources. As with other monitoring and assessment projects we have conducted for the State, it is anticipated that an external scientific advisory committee will be formed to assist in the design and implementation of this project.